



## EPA Region 7 TMDL Review

**TMDL ID:** KS-LA-10-524\_3      **Waterbody ID:** KS-LA-10-524\_3, KS-LA-10-524\_1, and KS-LA-10-287\_1755

**Waterbody Name:** Arkansas River

**Tributary:** Salt Creek (7), Arkansas River (4), Cow Creek (1), Cow Creek (1755)

**Pollutant:** Biology

**State:** KS      **HUC:** 11030010 and 11030011

**BASIN:** Gar-Peace Creek and Cow Creek Sub Basin; Lower Arkansas River Basin

**Submittal Date:** 1/9/2007

**Approved:** Yes

### Submittal Letter

*State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.*

The TMDL for the Arkansas River was formally submitted by the Kansas Department of Health and Environment (KDHE) in a letter received by EPA on December 11, 2006. The public comments and KDHE's response to those comments were formally submitted by KDHE in a letter received by EPA on January 9, 2007. Revisions to the TMDL were received by email and dated March 22, 2007.

### Water Quality Standards Attainment

*The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.*

The targeted pollutants are total nitrogen (TN) and total phosphorus (TP).

This TMDL links the narrative standard with the macroinvertebrate biological index (MBI), the ephemeroptera, plecoptera, trichoptera (EPT) index, and Kansas Biotic Index (KBI) scores reported as the nutrient oxygen demand component, as well as an EPT % Abundance score. All biological monitoring metrics scores were evaluated for Station 283 near Hutchison over the period of record (1982-2005). Nutrient concentrations were plotted against flow for Station 524 and against date for Stations 524 and 287.

Loading Capacity is shown as a load duration curve.

The loading capacity is identified as a load allocation (LA) of < 0.29 mg/L total phosphorus (TP) and < 2.9 mg/L total nitrogen (TN) in the Arkansas River, and wasteload allocations (WLAs) for the City of Hutchison 315 lb/day TN and 59 lb/day TP and for the South Hutchison Facility 49 lb/day TN and 8 lb/day TP, which should result in fully supporting the Special Aquatic Life Support designated use, as indicated by MBI, KBI, EPT, and EPT % Abundance biological indices scores. Meeting these targets should result in attainment of water quality standards (WQS).

### Numeric Target(s)

*Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.*

Designated Uses:

Special Aquatic Life Support	Primary Contact Recreation (B)	Secondary Contact Recreation (a),
Drinking Water Supply	Food Procurement	Groundwater Recharge
Irrigation Water	Industrial Water	Livestock Water

Impaired Use: Special Aquatic Life Support on segments 1 and 3 of the main stem

Nutrients – Narratives: The introduction of plant nutrients into streams, lakes or wetland from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life (KAR 28-16-28e(c)(2)(A)).

Biology:

MBI score Fully Supporting = 4.5

KBI-NO score Fully Supporting = 2.6

EPT score Fully Supporting = 13

EPT % Abundance score Fully Supporting = 48%

The state deems these conditions as not complying with their narrative WQS. The State of Kansas does not have numeric criterion for nutrients in their WQS. The river exceeded the narrative WQS which states that "water shall be free from" aesthetically objectionable conditions.

**Numeric Target(s) and Pollutant(s) of concern**

*An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.*

The State of Kansas does not have numeric criterion for nutrients in their WQS.

The loading capacity is calculated at the monitoring sites SC524 and SC287. The present load is depicted in load duration curves (figures 9 and 10), which give a graphical expression of the TMDL, at all percentiles of flow. This TMDL is determined by calculating the load that will result in reduction of the existing concentrations to meet the biological monitoring metrics scores for fully supporting the designated uses. The TMDL uses an expressed link through load duration curves for TN and TP loading and biological monitoring metrics.

**Source Analysis**

*Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.*

Upstream Contributions: Nutrient concentrations flowing into the main stem of the Arkansas River from upstream typically exceed the goals established in this TMDL. Upstream contributions have been summarized. Summary statistics were calculated for samples collected from 2000 forward, the period for which Total Kjeldahl Nitrogen has been collected allowing a calculation of total nitrogen. Total phosphorus from upstream sources was calculated based on the entire monitoring period, 1990-2005.

Land Use: The Kansas GAP dataset was used to analyze land use patterns in the watershed. Most of the watershed is cropland (65%), urban (13%) and grassland (18%), with limited other uses, results have been summarized.

CAFO: There are 26 known confined animal feeding operations in the drainage. The dominant type is a small (less than 300 animals) dairy, with limited beef, a single small swine and a single small horse operation. A summary of the operations by size and animal type is included. All sources, permit number, and daily WLA are listed in Appendix B found in the TMDL.

This TMDL is downstream from over 30,000 square miles of drainage, and as such is strongly dependent on upstream nutrient reductions for full compliance. A combination approach of USGS gages and USGS estimates of flow (Perry, et al., 2004) was used to calculate the approximate average flow contribution of upstream tributary segments. Results are summarized below.

Source of Flow	Percentage Contribution at 07143330
Arkansas River at Junction with Salt Creek	60%
Cow Creek	10%
Salt Creek	2.5%
Hutchinson WWTP	5%
Area in this TMDL	22.5%

All sources for Biology impairment due to TN and TP have been considered.

#### Allocation

*Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.*

The load duration curves are developed to identify the loading capacity at all flows. The load duration curves were established using the stage 2 endpoint ranges and the Dodds values.

The linkage between indices of biotic integrity and nutrient loading was originally developed based on observed biochemical oxygen demand stressors and known toxicity of ammonia to aquatic life. However, given the level of wastewater treatment above SB283 those concerns are not the contributing elements for the observed macroinvertebrate community structure. Instead, it is believed that the less than fully supporting designations at SB283 arise out of a more complicated linkage between overall elevated nutrient levels and involves in-stream benthic colonization by periphyton and other aquatic primary producers.

#### WLA Comment

I-AR98-PO01 (KS0091715) Reno CO. S.D. #202 WLA of TN 1.5 lb/day TP 0.5 lb/day.

City of Hutchison WWTF; limit of TN  $\leq 8$  mg/L resulting in a WLA of 315 lbs/day and limit of TP  $\leq 1.5$  mg/L resulting in a WLA of 59 lbs/day.

City of South Hutchison WWTF; limit of TN  $\leq 8$  mg/L resulting in a WLA of 49 lbs/day and limit of TP  $\leq 1.5$  mg/L resulting in a WLA of 8 lbs/day.

Other NPDES permitted dischargers and CAFOs WLA is zero.

## LA Comment

The load allocation (LA) is set through the use of a load duration curve. TP and TN for this TMDL will be reduced during flow events greater than median flow by 30%; that is average TN <2.9 mg/L and TP < 0.29 mg/L.

Nutrient loads observed at SC524 are impacted by the nutrients entering the area covered by this TMDL, as measured at SC522 and SC523. Therefore, this TMDL will also set an expected load of 0.1mg/L TP and 1.0 mg/L TN for those stations, reflecting background concentrations expected to be present. Loading exceeding these criteria shall be regarded as guidance for future TMDL development for these stations.

## Margin of Safety

*Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.*

The calculation and use of multiple biological metrics provides a MOS that Expected Aquatic Life Support designated use has been fully attained, and the designated use has been restored. A consistently compliant suite of scores for KBI-NO, MBI and EPT Index will be regarded as the requisite criteria for this TMDL. Fully supporting scores for these metrics will stand as evidence that plant nutrients entering the river from artificial sources have been controlled and are preventing the accelerated succession or replacement of aquatic biota and the production of undesirable quantities or types of aquatic life.

## Seasonal Variation and Critical Conditions

*Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).*

The load duration curve represents flow under all seasonal conditions. The LA and TMDL are applicable at all flow conditions, hence all seasons. The advantage of a LDC approach is to avoid the constraints associated with using a single-flow critical condition during the development of a TMDL. Therefore, all flow conditions including seasonal variation are taken into account for TMDL calculations. The low flow targets are based on eco-region backgrounds -critical condition while higher flows have more transient effects. The targets should result in WQS attainment regardless of the season.

## Public Participation

*Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).*

**Public Meetings:** Public meetings to discuss TMDLs in the Lower Arkansas Basin were held in Hutchinson on June 7, 2006. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Lower Arkansas Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Lower Arkansas Basin was held on September 13, 2006 in Hutchinson. The public record was held open until September 30, 2006.

**Basin Advisory Committee:** The Lower Arkansas Advisory Committee met to discuss the TMDLs in the basin on June 7, 2006 in Hutchinson.

## Monitoring Plan for TMDL(s) Under Phased Approach

*The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).*

KDHE will continue to monitor stream chemistry, including total nutrient concentrations at SC524, SC523, SC522, SC659 and SC287. Stream biology macroinvertebrates will continue to be collected at SB283. Wastewater discharges in the area covered under this TMDL will continue to be required to monitor total nutrient concentrations. Prior to 2011, KDHE will evaluate all new biological samples collected and determine if the river is fully supporting aquatic life, as indicated by the suite of metrics identified in the Defined Margin of Safety.

**Reasonable assurance**

*Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.*

There are several point sources in the watershed not contributing to the impairment that have been assigned a WLA of zero. The two point sources with assigned WLAs should be sufficient. Therefore, reasonable assurances are not required. Reasonable assurance, although not required, also include numerous authorities and funding through the Kansas Water Plan.

